

CLAIMS:

1. A method of embedding an additional layer of error correction into an error correcting code, wherein information is encoded into code words of said code and wherein a number of code words are arranged in the columns of a code block, said method comprising the steps of:

- 5 - reducing the length of each row of said code block by adding row symbols together according to a predetermined adding rule resulting in a reduced code block,
- encoding the shortened rows of said reduced code block using a horizontal error correcting code to obtain horizontal parities,
- embedding said horizontal parities as additional layer in said error correcting
10 code.

2. A method as claimed in claim 1,
wherein said code block is a Long Distance Code (LDC) block comprising LDC code words, in particular Reed Solomon code words over $GF(2^8)$, arranged in the columns of said LDC
15 block.

3. A method as claimed in claim 2,
further comprising the initial steps of:
- reducing the length of each LDC code word of said LDC block resulting in a
20 first intermediate block,
- extending each row of said first intermediate block by a predetermined number of symbols having predetermined values resulting in a second intermediate block which is used as code block in subsequent steps.

25 4. A method as claimed in claim 3,
wherein the length of each LDC code word is reduced by puncturing a predetermined number of symbols at predetermined positions of each LDC code word.

5. A method as claimed in claim 3,

wherein the length of each LDC code word is reduced by selecting a predetermined number of symbols of a LDC code word and by determining a predetermined number of parity symbols for said LDC code word.

- 5 6. A method as claimed in claim 3,
 wherein the rows of said first intermediate block are extended by adding a predetermined
 number of symbols having symbol value zero to each row.
7. A method as claimed in claim 1,
10 wherein the length of each row of said code block is reduced by adding the $(m+(j+i \bmod k))$ -
 th symbol of each row to the j -th symbol of the same row, i being the row number, j being the
 column number and m being the maximum number of columns divided by 2.
8. A method as claimed in claim 1,
15 wherein said code block comprises two blocks of a product code, in particular of a DVD
 product code, comprising product code words, in particular product code words of the same
 DVD product code such as code words over $GF(2^8)$, arranged in the columns of said code
 block.
- 20 9. A method as claimed in claim 1,
 wherein said horizontal parities are encoded by an additional error correcting code, in
 particular by a Burst Indicator Subcode (BIS) comprising Reed Solomon code words over
 $GF(2^8)$ or by an additional parity code comprising Reed Solomon code words over $GF(2^8)$.
- 25 10. A method of decoding an error correcting code into which an additional layer
 of error correction is embedded according to a method of claim 1, wherein horizontal parities
 are embedded as additional layer in said error correcting code and wherein a number of code
 words of said code are arranged in the columns of a code block, said method comprising the
 steps of:
- 30 - extracting said horizontal parities from said error correcting code,
 - reducing the length of each row of said code block by adding row symbols
 together identical to the method according to said predetermined adding rule used during the
 method of encoding according to claim 1 resulting in a reduced code block,

- decoding the shortened rows of said reduced code block using said horizontal parities.

11. A method as claimed in claim 10,

5 further comprising the steps of decoding a received data stream to obtain said code block and of correcting errors and erasures in the obtained code block by subtracting row symbols of said obtained code block from row symbols of said reduced code block according to a predetermined subtraction rule reverse to said predetermined adding rule.

10 12. Apparatus for embedding an additional layer of error correction into an error correcting code, wherein information is encoded into code words of said code and wherein a number of code words are arranged in the columns of a code block, comprising:

- means for reducing the length of each row of said code block by adding row symbols together according to a predetermined adding rule resulting in a reduced code block,
- 15 - means for encoding the shortened rows of said reduced code block using a horizontal error correcting code to obtain horizontal parities,
- means for embedding said horizontal parities as additional layer in said error correcting code.

20 13. Apparatus for decoding an error correcting code into which an additional layer of error correction is embedded according to a method of claim 1, wherein horizontal parities are embedded as additional layer in said error correcting code and wherein a number of code words of said code are arranged in the columns of a code block, comprising:

- means for extracting said horizontal parities from said error correcting code,
- 25 - means for reducing the length of each row of said code block by adding row symbols together identical to the method according to said predetermined adding rule used during the method of encoding according to claim 1 resulting in a reduced code block,
- means decoding the shortened rows of said reduced code block using said horizontal parities.

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14. Storage medium storing data in form of code words of an error correcting code into which an additional layer of error correction is embedded according to a method of claim 1, wherein horizontal parities are embedded as additional layer in said error correcting code

and wherein a number of code words of said code are arranged in the columns of a code block.

15. Signal comprising data in form of code words of an error correcting code into
5 which an additional layer of error correction is embedded according to a method of claim 1,
 wherein horizontal parities are embedded as additional layer in said error correcting code and
 wherein a number of code words of said code are arranged in the columns of a code block.
16. Computer program comprising program code means for causing a computer to
10 implement the steps of the method of claim 1 or 10 when said program is run on a computer.